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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/930,172	08/16/2001	Hiromasa Tanaka	57454-168	1155

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EXAMINER
WILKINS III, HARRY D

ART UNIT	PAPER NUMBER
1742	

DATE MAILED: 01/17/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	09/930,172	TANAKA ET AL.	
	Examiner	Art Unit	
	Harry D Wilkins, III	1742	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *02 December 2002* .

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-7* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-7* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *16 August 2001* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

11)☐ The proposed drawing correction filed on _____ is: a)☐ approved b)☐ disapproved by the Examiner.

If approved, corrected drawings are required in reply to this Office action.

12)☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

13)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☒ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____ .

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

14)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).

a) ☐ The translation of the foreign language provisional application has been received.

15)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____ .
4) ☐ Interview Summary (PTO-413) Paper No(s). _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: .

DETAILED ACTION

1. Claims 1-7 are pending.

2. All previous rejections have been withdrawn in view of Applicant's remarks filed 02 December 2002.

3. New grounds of rejection are presented below.

Claim Rejections - 35 USC § 102

4. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.
>
> (e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

5. Claims 1 and 3-7 are rejected under 35 U.S.C. 102(b) as being clearly anticipated by Murakami et al (US 5,413,643).

Murakami et al anticipate the invention as claimed. Murakami et al teach (see abstract) a method of making a rolling bearing constituted of an inner ring, an outer ring and a rolling element, which includes (see col 2, lines 50-56) starting with a steel, treating the steel by carburizing or carbonitriding (followed by quenching, see figure 2(a)) and finally a high temperature tempering at 220-240°C.

Murakami et al teach (see abstract and col 5, line 59 to col 6, line 7) that the steel has a composition that overlaps the presently claimed composition ranges.

	Claimed	Murakami et al	Overlap between Murakami et al and claimed
C	0.1-0.4 wt%	0.1-0.8 wt%°	At 0.1-0.4 wt%
Si	0.3-3.0 wt%	0.15-1.00 wt%	At 0.3-1.0 wt%
Mn	0.2-2.0 wt%	0.2-1.5 wt%	At 0.2-1.5 wt%
P	<0.03 wt%	Silent	At zero
S	<0.03 wt%	Silent	At zero
Cr	0.3-2.5 wt%	0.5-3.0 wt%	At 0.5-2.5 wt%
Ni	0.1-2.0 wt%	0.08-1.0 wt%	At 0.1-1.0 wt%
Al	<0.05 wt%	Silent	At zero
Ti	<0.003 wt%	Silent	At zero
O	<0.0015 wt%	Silent	At zero
N	<0.025 wt%	Silent	At zero

°For steels to be carburized/carbonitrided, the steel contains 0.1-0.8 wt% C (see col 2, lines 50-56)

Though Murakami is silent on the contents of P, S, Al, Ti, O and N, each of these elements would have been considered to be an undesired impurity, and thus, reduced to as low an amount as possible, such that they would be considered to be zero, which is within the claimed ranges. Murakami et al teach (see Table 2) that the inventive steels have hardness in the range of 720-782 HV, which is about HRC 59-61. Thus, Murakami et al teaches an identical method, with an identical composition, and producing identical properties as the presently claimed invention.

Regarding the presence of Mo in the steel of Maeda, the present claim recites a composition "containing" certain elements. This language is interpreted to mean that the composition is open to additional elements, even in major amounts.

Regarding claims 3 and 7, the range of Mn+Ni taught by Ochi et al is 0.4-5.3 wt%. Thus, Ochi et al teach an overlapping range for Mn+Ni at 1.5-4.0 wt%.

Regarding claims 5 and 6, Murakami et al teach (see col 2, lines 50-56 and figures 2(a)-2(c)) that between the carburizing quenching and the tempering, the steel is annealed (fig. 2(b)) and quenched (i.e.-secondary quenching).

6. Claims 1, 3 and 4 are rejected under 35 U.S.C. 102(e) as being anticipated by Maeda (US 6,197,128)

The applied reference has a common inventor with the instant application. Based upon the earlier effective U.S. filing date of the reference, it constitutes prior art under 35 U.S.C. 102(e). This rejection under 35 U.S.C. 102(e) might be overcome either by a showing under 37 CFR 1.132 that any invention disclosed but not claimed in the reference was derived from the inventor of this application and is thus not the invention "by another," or by an appropriate showing under 37 CFR 1.131.

Maeda anticipates the invention as claimed. Maeda teaches (see abstract) a rolling bearing component with a rolling bearing ring and a rolling element made from a composition that overlaps the presently claimed composition range.

	Claimed	Maeda	Overlap
C	0.1-0.4 wt%	0.3-0.6 wt%	At 0.3-0.4 wt%
Si	0.3-3.0 wt%	0.1-0.35 wt%	At 0.3-0.35 wt%
Mn	0.2-2.0 wt%	1.1-1.5 wt%	At 1.1-1.5 wt%
P	<0.03 wt%	Silent	At Zero
S	<0.03 wt%	Silent	At Zero
Cr	0.3-2.5 wt%	0.5-2.0 wt%	At 0.5-2.0 wt%
Ni	0.1-2.0 wt%	0.2-0.6 wt%	At 0.2-0.6 wt%
Al	<0.05 wt%	Silent	At Zero
Ti	<0.003 wt%	Silent	At Zero
O	<0.0015 wt%	Silent	At Zero
N	<0.025 wt%	Silent	At Zero

Though Maeda is silent on the contents of P, S, Al, Ti, O and N, each of these elements would have been considered to be an undesired impurity, and thus, reduced to as low

an amount as possible, such that they would be considered to be zero, which is within the claimed ranges. Maeda teaches (see col 4, lines 5-11, col 6, lines 44-49, col 7, lines 38-45 and Table 5) that the steel is subjected to carburizing or carbonitriding and then subjected to tempering at a temperature of at least 230°C. The process inherently possesses a step of quenching after the carburizing/carbonitriding step because the temperature of the workpiece goes from 850°C to approximately 90°C (Table 2). The example in Table 5 tempered at 230°C has a surface hardness of 745 Hv, which is about HRC60.

Regarding the presence of Mo in the steel of Maeda, the present claim recites a composition "containing" certain elements. This language is interpreted to mean that the composition is open to additional elements, even in major amounts.

Regarding claim 3, the range of Mn+Ni taught by Maeda is 1.3-2.1 wt%. Thus, Maeda teaches an overlapping range for Mn+Ni at 1.5-2.1 wt%.

Regarding claim 4, Maeda teaches an method, as above, including starting with a steel material having a composition as claimed, performing carburizing and/or carbonitriding followed by quenching, and finally tempering at 230°C. Thus, Maeda teaches the method as claimed.

Claim Rejections - 35 USC § 103

7. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

8. Claims 1-7 are rejected under 35 U.S.C. 103(a) as being unpatentable over Murakami et al (US 5,413,643) in view of Ochi et al (EP 0933440).

The teachings of Murakami et al are described above in paragraph no. 5. Murakami et al is silent about the contents of P, S, Al, Ti, O and N.

Ochi et al teach a similar case hardening steel (i.e.-same field of endeavor) that teaches limiting each of these elements to certain ranges. Ochi et al teach (see paragraphs 20, 21, 23, 29, 30 and 31) that P should be maintained at less than 0.025 wt% to avoid degrading properties of case hardening steels, S should be kept at 0.001-0.01 wt% (desirable) to maintain machinability without segregation of MnS, Al should be added at 0.015-0.04 wt% to insure effective grain growth suppression, Ti should be kept below 0.0025 wt% (desirable) to avoid a reduction in the suppression of grain growth, O should be kept below 0.0012 wt% (desirable) to avoid an increase in oxides which cause rolling fatigue failure and N should be added at 0.006-0.020 wt% to achieve grain refinement.

Therefore, it would have been obvious to one of ordinary skill in the art to have limited the elements P, S, Al, Ti, O and N to the ranges taught by Ochi et al in the steel of Murakami et al because of the reasons for maintaining these elements at the disclosed levels provided for by Ochi et al in paragraphs 20, 21, 23, 29, 30 and 31.

Regarding claim 2, Murakami et al teach (see col 5, line 59 to col 6, line 7) that the steel may contain 0.08-2.0 wt% Mo. Murakami et al do not teach adding V. Ochi et al teach (see paragraph no. 28) that V is added at 0.03-0.5 wt% for adding strength and hardenability to case hardening steels. Therefore, it would have been obvious to one of

ordinary skill in the art to have added 0.03-0.5 wt% V as taught by Ochi et al to the case hardening steel of Murakami et al because Ochi et al teach that V adds strength and hardenability to the steel.

Regarding claims 3-7, see paragraph no. 6 above about these claims.

9. Claims 1, 2 and 4 are rejected under 35 U.S.C. 103(a) as being unpatentable over Maeda (US 6,197,128) in view of Ochi et al (EP 0933440).

The teachings of Maeda are described above in paragraph no. 6. Maeda is silent about the contents of P, S, Al, Ti, O and N.

Ochi et al teach a similar case hardening steel (i.e.-same field of endeavor) that teaches limiting each of these elements to certain ranges. Ochi et al teach (see paragraphs 20, 21, 23, 29, 30 and 31) that P should be maintained at less than 0.025 wt% to avoid degrading properties of case hardening steels, S should be kept at 0.001-0.01 wt% (desirable) to maintain machinability without segregation of MnS, Al should be added at 0.015-0.04 wt% to insure effective grain growth suppression, Ti should be kept below 0.0025 wt% (desirable) to avoid a reduction in the suppression of grain growth, O should be kept below 0.0012 wt% (desirable) to avoid an increase in oxides which cause rolling fatigue failure and N should be added at 0.006-0.020 wt% to achieve grain refinement.

Therefore, it would have been obvious to one of ordinary skill in the art to have limited the elements P, S, Al, Ti, O and N to the ranges taught by Ochi et al in the steel of Maeda because of the reasons for maintaining these elements at the disclosed levels provided for by Ochi et al in paragraphs 20, 21, 23, 29, 30 and 31.

Regarding claim 2, Maeda teaches (see abstract) that the steel may contain 0.15-0.5 wt% Mo. Maeda does not teach adding V. Ochi et al teach (see paragraph no. 28) that V is added at 0.03-0.5 wt% for adding strength and hardenability to case hardening steels. Therefore, it would have been obvious to one of ordinary skill in the art to have added 0.03-0.5 wt% V as taught by Ochi et al to the case hardening steel of Maeda because Ochi et al teach that V adds strength and hardenability to the steel.

Regarding claim 4, see paragraph no. 7 above about this claim.

10. Claims 1-3 are rejected under 35 U.S.C. 103(a) as being unpatentable over Maeda et al (5,595,610) in view of Mitamura (JP 03-153842).

Maeda et al teach (see claims 1 and 6) a case hardening steel that has a composition which overlaps the presently claimed composition ranges.

	Claimed	Maeda et al	Overlap
C	0.1-0.4 wt%	0.03-0.27 wt%	At 0.1-0.27 wt%
Si	0.3-3.0 wt%	0.05-0.35 wt%	At 0.3-0.35 wt%
Mn	0.2-2.0 wt%	0.3-2.0 wt%	At 0.3-2.0 wt%
P	<0.03 wt%	Silent	At zero
S	<0.03 wt%	<0.03 wt%*	At <0.03 wt%
Cr	0.3-2.5 wt%	0.03-1.5 wt%	At 0.3-1.5 wt%
Ni	0.1-2.0 wt%	0.4-3.0 wt%	At 0.4-2.0 wt%
Al	<0.05 wt%	0.015-0.1 wt%	At 0.015-0.05 wt%
Ti	<0.003 wt%	Silent	At zero
O	<0.0015 wt%	Silent	At zero
N	<0.025 wt%	0.004-0.02 wt%	At 0.004-0.02 wt%
Mo	0.05-2.5 wt%	0.1-1.0 wt%	At 0.1-1.0 wt%
V	0.05-1.0 wt%	0.03-0.5 wt%	At 0.05-0.5 wt%

*The claim contains a typographical error, it should be <0.03 wt% as per col 2, line 30.

Maeda et al teach (see claim 1) that the method of production includes carburizing and/or carbonitriding followed by quenching. The process also includes (see Figures 3 and 4) tempering, but at a temperature of 170°C.

The differences between the invention of Maeda et al and the present invention are that (1) Maeda et al do not teach that the tempering step occurs at temperatures of 200-350°C and (2) Maeda et al do not teach that the steel is made into a rolling bearing component having an inner ring, outer ring and a rolling element.

Mitamura teaches (see English abstract) a rolling bearing constituted of a bearing ring and a rolling element made from a steel with a composition similar to the steel of Maeda et al. Mitamura teaches that the steel is subjected to a high temperature tempering (at 240-550°C) in order to impart to the steel a better high temperature service life.

Therefore, it would have been obvious to one of ordinary skill in the art to have applied the high temperature tempering step of Mitamura to the steel of Maeda et al because the tempering step improves the service life of a rolling bearing at higher operating temperatures and it would have been obvious to make a rolling bearing from the case hardening steel of Maeda et al because it has properties, such as high surface hardness after carburizing, that make it ideal for use as a rolling bearing.

Regarding claim 3, the range of Mn+Ni taught by Maeda et al is 0.7-5.0 wt%. Thus, Maeda et al teach an overlapping range for Mn+Ni at 1.5-4.0 wt%.

11. Claims 1-3 are rejected under 35 U.S.C. 103(a) as being unpatentable over Ochi et al (EP 0933440) in view of Mitamura (JP 03-153842).

Ochi et al teach (see abstract) a case hardening steel that has a composition which overlaps the presently claimed composition ranges.

	Claimed	Ochi et al	Overlap
C	0.1-0.4 wt%	0.1-0.4 wt%	At 0.1-0.4 wt%
Si	0.3-3.0 wt%	0.02-1.3 wt%	At 0.3-1.3 wt%
Mn	0.2-2.0 wt%	0.3-1.8 wt%	At 0.3-1.8 wt%
P	<0.03 wt%	<0.025 wt%	At <0.025 wt%
S	<0.03 wt%	0.001-0.15 wt%	At 0.001-0.03 wt%
Cr	0.3-2.5 wt%	0.4-1.8 wt%	At 0.4-1.8 wt%
Ni	0.1-2.0 wt%	0.1-3.5 wt%	At 0.1-2.0 wt%
Al	<0.05 wt%	0.015-0.04 wt%	At 0.015-0.04 wt%
Ti	<0.003 wt%	<0.01 wt%*	At <0.0025 wt%*
O	<0.0015 wt%	<0.0025 wt%**	At <0.0012 wt%**
N	<0.025 wt%	0.006-0.02 wt%	At 0.006-0.02 wt%
Mo	0.05-2.5 wt%	0.02-1.0 wt%	At 0.05-1.0 wt%
V	0.05-1.0 wt%	0.03-0.5 wt%	At 0.05-0.5 wt%

*Ochi et al provide (see paragraph 30) a desired range of <0.0025 wt% Ti.
**Ochi et al provide (see paragraph 31) a desired range of <0.0012 wt% O.

Ochi et al teach (see paragraph 61) that the method of production includes carburizing followed by quenching (water cooling).

The differences between the invention of Ochi et al and the present invention are that (1) Ochi et al do not teach a tempering step that occurs at temperatures of 200-350°C and (2) Ochi et al do not teach that the steel is made into a rolling bearing component having an inner ring, outer ring and a rolling element.

Mitamura teaches (see English abstract) a rolling bearing constituted of a bearing ring and a rolling element made from a steel with a composition similar to the steel of Maeda et al. Mitamura teaches that the steel is subjected to a high temperature tempering (at 240-550°C) in order to impart to the steel a better high temperature service life.

Therefore, it would have been obvious to one of ordinary skill in the art to have applied the high temperature tempering step of Mitamura to the steel of Ochi et al because the tempering step improves the service life of a rolling bearing at higher

operating temperatures and it would have been obvious to make a rolling bearing from the case hardening steel of Ochi et al because it has properties, such as high surface hardness after carburizing, that make it ideal for use as a rolling bearing.

Regarding claim 3, the range of Mn+Ni taught by Ochi et al is 0.4-5.3 wt%. Thus, Ochi et al teach an overlapping range for Mn+Ni at 1.5-4.0 wt%.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Harry D Wilkins, III whose telephone number is 703-305-9927. The examiner can normally be reached on M-Th 6:00am-4:30pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Roy V King can be reached on 703-308-1146. The fax phone numbers for the organization where this application or proceeding is assigned are 703-872-9310 for regular communications and 703-872-9311 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is 703-308-0661.

Harry D Wilkins, III
Examiner
Art Unit 1742

hdw
January 16, 2003

ROY KING
SUPERVISORY PATENT EXAMINER
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